

**A PROCESS AND A FLUFFER DEVICE FOR TREATMENT OF A  
FIBER STOCK SUSPENSION**

**BACKGROUND OF THE INVENTION**

5     **1. Field of the invention.**

          The present invention relates to a process and device for the treatment of a fiber stock suspension, intended specifically for paper and/or cardboard production, and, more particularly, to a process of adding at least one additive thereto.

**2. Description of the related art.**

10           The gentle handling of raw material resources necessitated specifically by economic and ecological reasons manifests itself in paper production in increasingly low basis weights of the paper web, as well as in partial replacement of the fiber stock by fillers. In order to achieve the strongest possible adhesion of the fillers onto the fiber surfaces, the latest appropriate treatment is a so-called "Fiber Loading<sup>TM</sup>," process, as described in U.S. Patent No. 5,223,090, which is

15     hereby incorporated by reference. During such a "Fiber Loading<sup>TM</sup>," process, at least one additive, specifically a filler, is added to the moistened fiber surfaces of the fiber material. The fibers may, for instance, be loaded with calcium carbonate. For this purpose calcium oxide and/or calcium hydroxide is added to the moist disintegrated fiber material, whereby at least a portion thereof may associate with the water that is present in addition to the fiber material. The

20     fiber material treated in this manner is then supplied with pure carbon dioxide or with a medium containing carbon dioxide. Moreover, the resulting CaCO<sub>3</sub> may create a fiber stock suspension around the fibers.

          Also, when loading the fibers with a particular additive or filler, the procedure as described in U.S. Patent No. 5,223,090 may specifically be followed.

A pre-treatment of the paper suspension is necessary for the aforementioned "Fiber Loading™" process. However, the problem is that hitherto no optimally suitable machine was available for such a process.

### **SUMMARY OF THE INVENTION**

5           The present invention provides a pretreatment process and device which is optimally suitable for the aforementioned "Fiber Loading™" process.

Relative to the process, the treatment of the fiber stock suspension occurs at least partially, in a fluffer, in which the fiber material of the fiber suspension is separated in a manner so as to increase the specific surface of the fiber material so that the accessibility for the educts to  
10   the fiber material surface is optimized.

The fluffer may be located prior to, as well as after, at least one reactor or similar device. The specific surface of the fiber stock suspension is enlarged in the fluffer, resulting in a marked homogenization improvement and "Fiber Loading™" process optimization.

A process optimization is achieved by dividing the fiber material using toothed disks  
15   and/or fluffer knives, whereby the specific surface of the fiber material is increased so that the accessibility for the educts to the fiber material surface is optimized.

The working area of the fluffer is preferably pressurized. The appropriate pressure value may specifically be in an approximate range of 0.1 – 20 bar.

Advantageously, fiber stock suspension volume and mass flow rate are adjustable within  
20   an approximate range of 5 tons per day to 1500 tons per day.

The temperature of the fiber stock suspension having been subjected to the pre-treatment is appropriately adjustable within an approximate range of 5°C to 250°C.

In accordance with one advantageous form of the process according to the invention, an additive, for example PCC (precipitated calcium carbonate) or FLPCC™ (fiber loaded

precipitated calcium carbonate), is added to the fiber stock suspension, at an approximate ratio of 15% to 40% and, preferably, of 20% to 25%.

An approximate pH value of 10 to 13 can be set for the fiber stock suspension, particularly prior to the reaction with the CO<sub>2</sub>.

5 CaCO<sub>3</sub> may be added prior to, in and/or after the fluffer to the fiber stock suspension.

For the temperature of the CaCO<sub>3</sub>, a preferred value of approximately -10 ° C to approximately 250° C is selected.

In principle it is also possible to add Ca(OH)<sub>2</sub> (slaked lime) to the fiber stock suspension prior to, in and/or after the fluffer.

10 The Ca(OH)<sub>2</sub> may be added specifically at a ratio of approximately 1% to approximately 60%.

The lime particle surface may, for example, be selected to be larger than 30,000 cm<sup>2</sup>/g.

The width of the nip between the fluffer disks is adjustable, preferably within a range of approximately 0.1 mm to approximately 100 mm.

15 The energy requirement is selected to be, preferably, within a range of approximately 5 kWh/t to approximately 200 kWh/t.

The device of the present invention comprises, in one form thereof, a fluffer that is equipped with a fiber stock suspension infeed device and that is configured for separating the fiber suspension's fiber material in a manner so as to enlarge the specific surface of the fiber  
20 material so that accessibility for the educts to the fiber surface is optimized.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood

by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a schematic side view of a fluffer intended for pre-treatment of a fiber stock suspension, with corresponding drive motor;

5 Fig. 2 is a schematic sectional illustration of the fluffer, according to Fig. 1; and

Fig. 3 is a schematic illustration of an example, comprising at least one Fluffer, preferably an arrangement according to Fig. 1, and intended specifically for a so-called "Fiber Loading<sup>TM</sup>" process.

Corresponding reference characters indicate corresponding parts throughout the several  
10 views. The exemplification set out herein illustrates one preferred embodiment of the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

### **DETAILED DESCRIPTION OF THE INVENTION**

Figs. 1 and 2 are a schematic depiction of a fluffer 10, that is intended for the  
15 pretreatment of a fiber stock suspension, specifically in paper and/or cardboard production. The relevant treatment serves the addition of at least one additive, specifically a filler, on the moistened fiber surfaces of the fiber material. This loading of the fibers with additives, or fillers, may occur specifically in accordance with the aforementioned "Fiber Loading<sup>TM</sup>" process.

Fluffer 10 includes fluffer disks 12 which are equipped with one or more tooth patterns  
20 and/or knives. Between adjoining fluffer disks 12, a gap 14 is formed in which the fiber material of the fiber stock suspension is divided in order to enlarge the specific surface of the fiber material. By such enlargement, the accessibility for the educts to the fiber material surface is optimized. Knives may be provided alternatively or in addition to one or more tooth patterns.

The fiber stock suspension is supplied to fluffer 10 through an inlet 16.

The fluffer 10 also includes, preferably, a variably adjustable fiber stock suspension outlet 18.

In the present example inlet 16 is positioned horizontally. In contrast, the fiber stock suspension, which is pre-treated in fluffer 10, is discharged vertically downward through outlet

18.

Fluffer 10 is connected to and driven by an electric motor 20 (see Fig. 1) via a coupling

22.

Operating or working area 24 of fluffer 10 can be put under pressure. The preferably variably adjustable pressure value may, for example, be in the approximate range of 0.1 to 20

bar.

The volume and mass flow rate of the fiber stock suspension are adjustable, for example, within a range of approximately 5 tons per day to approximately 1500 tons per day.

The temperature of the fiber stock suspension that was pre-treated in fluffer 10 may, for example, be adjustable within a range of approximately 5° C to approximately 250° C.

An additive, for example PCC (precipitated calcium carbonate) or FLPCC™ (fiber loaded precipitated calcium carbonate), is added to the fiber stock suspension at an approximate ratio of 15% to 40%, and preferably at a ratio of approximately 20% to approximately 25%.

The treatment of the fiber stock suspension may, for example, be conducted so that a pH-value of approximately 10 to approximately 13 is set prior to the reaction with the CO<sub>2</sub>.

Specifically, CaCO<sub>3</sub> may be added prior to, in and/or after fluffer 10 to the fiber stock suspension. The temperature of the CaCO<sub>3</sub> may, for example, be approximately -10 ° C to approximately 250° C.

It is also possible to add Ca(OH)<sub>2</sub> (slaked lime) to the fiber stock suspension prior to, in and/or after fluffer 10.

The  $\text{Ca}(\text{OH})_2$  may be added specifically at a ratio of approximately 1% to approximately 60%.

A lime particle surface larger than  $30,000 \text{ cm}^2/\text{g}$  would preferably be selected.

The width of nip 14 between fluffer disks 12 is adjustable, for example, within a range of approximately 0.1 mm to approximately 100 mm. A pusher 26 may be provided for this purpose, which would be adjustable in the direction of double arrow F (see Fig. 2).

The energy requirement is preferably within an approximate range of 5 kWh/t to 200 kWh/t.

Fig. 3 is a schematic illustration of an example arrangement including at least one fluffer 10, intended specifically for a so-called "Fiber Loading<sup>TM</sup>" process. Each fluffer 10 may be designed in the manner illustrated with Figs. 1 and 2. Fluffer 10 may be located either prior to or after at least one reactor 28, 28'. One fluffer 10 is located between a refiner 30 and at least one reactor 28, 28'. Alternatively or additionally, it is also possible to position such fluffer 10 between at least one reactor 28, 28' and a tank 32. A refiner 34 is located again after tank 32, then leading into paper machine PM. Additionally or alternatively, at least one additive infeed 36 (shown schematically) can be provided, each of which is coupled with one of inlet 16 and fluffer 10 to supply a flow of at least one additive thereto. All other details in Fig. 3 are merely exemplary in nature.

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.